Claim Amendments

1. (currently amended) A method for positioning wireless transceivers in a lossy environment, comprising the steps of:

determining the attenuation factor throughout the lossy environment;

<u>using the determined attenuation factor to</u> select[[~~ing~~]] at least one transmission frequency; [[~~and~~]]

<u>using said attenuation factor and selected transmission frequency to position</u> ~~positioning the~~ transceivers a distance apart <u>within said lossy environment</u>, the distance selected to ensure reception of an electromagnetic signal transmitted at the selected frequency<u>, wherein said distance permits transmission of an electromagnetic signal at said frequency with equal to or less than 98% signal attenuation; and,</u>

<u>wherein there are at least two transceivers positioned in the lossy environment</u>.

2. (cancelled)

3. (original) The method of claim 1, further comprising the step of determining the distance between transceivers which will permit transmission of an electromagnetic signal with equal to or less than 90% signal attenuation.

4. (original) The method of claim 1, further comprising the step of determining the distance between transceivers which will permit transmission of an electromagnetic signal with equal to or less than 80% signal attenuation.

5. (original) The method of claim 1, further comprising the step of determining the distance between transceivers which will permit transmission of an electromagnetic signal with equal to or less than 70% signal attenuation.

6. (original) The method of claim 1, further comprising the step of determining the distance between transceivers which will permit transmission of an electromagnetic signal with equal to or less than 60% signal attenuation.

7. (original) The method of claim 1, wherein the lossy environment is penetrated by at least one borehole.

8. (original) The method of claim 1, wherein the lossy environment is penetrated by at least one mineshaft.

9. (original) The method of claim 1, wherein the lossy environment surrounds a cave.

10. (original) The method of claim 1, wherein the transmission frequency is between about 15 Hz and 5 kHz.

11. (original) The method of claim 1, wherein the step of determining the attenuation factor throughout the lossy environment comprises the step of determining the resistivity throughout the lossy environment.

12. (original) The method of claim 1, wherein at least one transceiver is located within the lossy environment and at least one transceiver is outside the lossy environment.

13. (original) The method of claim 1, wherein at least two transceivers are located within the lossy environment.

14. (original) The method of claim 1, wherein the transceivers are positioned in a manner to produce substantially the same signal attenuation from one transceiver to another transceiver.

15. (currently amended) A method for positioning electromagnetic transceivers within a borehole comprising the steps of:

determining the resistivity of a given length of borehole;

using said resistivity to determine ~~determining~~ the attenuation profile at a selected frequency for the given length of borehole;

using the determined attenuation profile to select[[~~ing~~]] at least one transmission frequency; [[~~and,~~]]

positioning the transceivers in the given length of borehole, the distance from one ~~receiver to the next receiver~~ transceiver to the next transceiver being selected to ensure signal reception between transceivers wherein said distance permits transmission of an electromagnetic signal at said frequency with equal to or less than 98% signal attenuation; and,

wherein there are at least two transceivers positioned in the borehole.

16. (original) The method of claim 15, wherein the electromagnetic transceivers operate at frequencies ranging from about 15 Hz to about 5 kHz.

17. (cancelled)

18. (original) The method of claim 15, further comprising the step of determining the distance between transceivers which will permit transmission of an electromagnetic signal with equal to or less than 90% signal attenuation.

19. (original) The method of claim 15, further comprising the step of determining the distance between transceivers which will permit transmission of an electromagnetic signal with equal to or less than 80% signal attenuation.

20. (original) The method of claim 15, further comprising the step of determining the distance between transceivers which will permit transmission of an electromagnetic signal with equal to or less than 70% signal attenuation.

21. (original) The method of claim 15, further comprising the step of determining the distance between transceivers which will permit transmission of an electromagnetic signal with equal to or less than 60% signal attenuation.

22. (original) The method of claim 15, wherein the transceivers are positioned in a manner to produce substantially the same signal attenuation from one transceiver to another transceiver.

23. (currently amended) A method for transmitting an electromagnetic signal through a subsurface lossy environment comprising the steps of:

determining the attenuation factor for the path of the electromagnetic signal through the lossy environment;

using the determined attenuation factor to select[[~~ing~~]] at least one transmission frequency;

positioning at least ~~one transceiver~~ two transceivers within the lossy environment and at least one transceiver outside the lossy environment, the distance between the transceivers being selected to ensure reception of an electromagnetic signal such that the selected frequency produces equal to or less than about 98% signal attenuation; and,

transmitting an electromagnetic signal from one transceiver to the other transceiver through the lossy environment at the selected transmission frequency wherein the electromagnetic signal is transmitted in real time without buffering.

24. (original) The method of claim 23, comprising positioning at least two transceivers within the lossy environment and at least one transceiver outside the lossy environment and wherein the transceiver outside the lossy environment transmits an electromagnetic signal through the lossy environment to an intermediate transceiver and the intermediate transceiver immediately conveys the electromagnetic signal through the lossy environment to another transceiver.

25. (original) The method of claim 23, comprising positioning at least two transceivers within the lossy environment and at least one transceiver outside the lossy environment and wherein one transceiver within the lossy environment transmits an electromagnetic signal through the lossy environment to at least one intermediate transceiver within the lossy environment and the intermediate transceiver immediately conveys the electromagnetic signal through the lossy environment to another transceiver within the lossy environment or to the transceiver outside the lossy environment.

26. (cancelled)

27. (original) The method of claim 23, wherein the distance produces equal to or less than about 90% signal attenuation.

28. (original) The method of claim 23, wherein the distance produces equal to or less than about 80% signal attenuation.

29. (original) The method of claim 23, wherein the distance produces equal to or less than about 70% signal attenuation.

30. (original) The method of claim 23, wherein the distance produces equal to or less than about 60% signal attenuation.

31. (original) The method of claim 23, wherein the lossy environment is penetrated by at least one borehole.

32. (original) The method of claim 23, wherein the lossy environment is penetrated by at least one mineshaft.

33. (original) The method of claim 23, wherein the lossy environment surrounds a natural opening.

34. (original) The method of claim 23, wherein the transmission frequency is between about 15 Hz and 5 kHz.

35. (original) The method of claim 23, wherein the step of determining the attenuation factor comprises the step of determining the resistivity for the path of the electromagnetic signal through the lossy environment.

36. (original) The method of claim 23, wherein the transmission frequency automatically changes in response to a change in the attenuation factor.

37. (original) The method of claim 23, wherein the transmission frequency automatically changes to a lower frequency in response to a change in the attenuation factor.

38. (original) The method of claim 23, wherein the transmission frequency automatically changes when a transceiver does not receive a transmission within a predetermined period of time.

39. (original) The method of claim 23, wherein the transmission frequency automatically changes to a lower frequency when a transceiver does not receive a transmission within a predetermined period of time.

40. (original) The method of claim 24, wherein the transceivers are positioned in a manner to produce substantially the same signal attenuation from one transceiver to another transceiver.

41. (original) The method of claim 23, wherein a transceiver receiving a signal retransmits the signal on a different frequency from the received signal.

42. (currently amended) A method for transmitting an electromagnetic signal through a lossy environment comprising the steps of:

determining the attenuation factor throughout the lossy environment;

using the determined attenuation factor to select[[~~ing~~]] at least one transmission frequency;

positioning at least two transceivers a distance apart within the lossy environment, the distance between the transceivers being selected to ensure reception of an electromagnetic signal such that the distance and selected frequency produces equal to or less than about 98% signal attenuation; and,

transmitting an electromagnetic signal from one transceiver to the other transceiver through the lossy environment wherein the electromagnetic signal is transmitted in real time without buffering.

43. (original) The method of claim 42, comprising positioning at least three transceivers within the lossy environment, wherein a first transceiver transmits an electromagnetic signal to a second transceiver and the second transceiver immediately conveys the electromagnetic signal to the third transceiver.

44. (cancelled)

45. (original) The method of claim 42, wherein the distance produces equal to or less than about 90% signal attenuation.

46. (original) The method of claim 42, wherein the distance produces equal to or less than about 80% signal attenuation.

47. (original) The method of claim 42, wherein the distance produces equal to or less than about 70% signal attenuation.

48. (original) The method of claim 42, wherein the distance produces equal to or less than about 60% signal attenuation.

49. (original) The method of claim 42, wherein the lossy environment is penetrated by at least one borehole.

50. (original) The method of claim 42, wherein the lossy environment is penetrated by at least one mineshaft.

51. (original) The method of claim 42, wherein the lossy environment surrounds a natural opening.

52. (original) The method of claim 42, wherein the transmission frequency is between about 15 Hz and 5 kHz.

53. (original) The method of claim 42, wherein the step of determining the attenuation factor comprises the step of determining the resistivity for the path of the electromagnetic signal through the lossy environment.

54. (original) The method of claim 43, wherein a transceiver receiving a signal retransmits the signal on a different frequency from the received signal.

55. (original) The method of claim 42, wherein the transmission frequency automatically changes in response to a change in the attenuation factor.

56. (original) The method of claim 42, wherein the transmission frequency automatically changes to a lower frequency in response to a change in the attenuation factor.

57. (original) The method of claim 42, wherein the transmission frequency automatically changes when a transceiver does not receive a transmission within a predetermined period of time.

58. (original) The method of claim 42, wherein the transmission frequency automatically changes to a lower frequency when a transceiver does not receive a transmission within a predetermined period of time.

59. (original) The method of claim 42, wherein the transceivers are positioned in a manner to produce substantially the same signal attenuation from one transceiver to another transceiver.

60. (currently amended) A method for the real time transmission of an electromagnetic signal from the surface through a lossy environment comprising the steps of:

determining the resistivity along the path of the electromagnetic signal through the lossy environment;

using the determined resistivity to select[[~~ing~~]] at least one transmission frequency;

positioning a transceiver at the surface;

positioning at least one intermediate transceiver in the lossy environment;

positioning at least one target transceiver within the lossy environment, wherein the distance between each transceiver is that distance which will provide an attenuation factor low enough to permit reception of an electromagnetic signal transmitted at the selected frequency from one transceiver to another transceiver such that the distance and frequency produces equal to or less than about 98% signal attenuation; and,

transmitting an electromagnetic signal in real time from the surface transceiver to at least one target transceiver, the electromagnetic signal passing through at least one intermediate transceiver prior to reception at a target transceiver wherein the electromagnetic signal is transmitted without buffering by said transceivers.

61. (cancelled)

62. (original) The method of claim 60, wherein the distance between each transceiver is that distance which will produce equal to or less than about 90% signal attenuation.

63. (original) The method of claim 60, wherein the distance between each transceiver is that distance which will produce equal to or less than about 80% signal attenuation.

64. (original) The method of claim 60, wherein the distance between each transceiver is that distance which will produce equal to or less than about 70% signal attenuation.

65. (original) The method of claim 60, wherein the distance between each transceiver is that distance which will produce equal to or less than about 60% signal attenuation.

66. (original) The method of claim 60, wherein the lossy environment is penetrated by at least one borehole.

67. (original) The method of claim 60, wherein the lossy environment is penetrated by at least one mineshaft.

68. (original) The method of claim 60, wherein the lossy environment surrounds a cave.

69. (original) The method of claim 60, wherein the transmission frequency is between about 15 Hz and 5 kHz.

70. (original) The method of claim 60, wherein the transmission frequency automatically changes in response to a change in the attenuation factor.

71. (original) The method of claim 60, wherein the transmission frequency automatically changes to a lower frequency in response to a change in the attenuation factor.

72. (original) The method of claim 60, wherein the transmission frequency automatically changes when a transceiver does not receive a transmission within a predetermined period of time.

73. (original) The method of claim 60, wherein the transmission frequency automatically changes to a lower frequency when a transceiver does not receive a transmission within a predetermined period of time.

74. (original) The method of claim 60, wherein the transceivers are positioned in a manner to produce substantially the same signal attenuation from one transceiver to another transceiver.

75. (original) The method of claim 60, wherein a transceiver receiving a signal retransmits the signal on a different frequency from the received signal.

76. (currently amended) A method for the real time transmission of an electromagnetic signal through a lossy environment comprising the steps of:

determining the resistivity along the path of the electromagnetic signal through the lossy environment;

<u>using the determined resistivity to</u> select[[~~ing~~]] at least one transmission frequency;

positioning at least one transceiver at the surface;

positioning at least one intermediate transceiver in the lossy environment;

positioning at least one target transceiver within the lossy environment, wherein the distance between each transceiver is that distance which will provide an attenuation factor low enough to permit reception of an electromagnetic signal transmitted at the selected frequency

from one transceiver to another transceiver such that the distance and frequency produces equal to or less than about 98% signal attenuation; and,

transmitting an electromagnetic signal in real time from at least one target transceiver or surface transceiver through at least one intermediate transceiver prior to reception by at least one target transceiver or surface transceiver wherein the electromagnetic signal is transmitted in real time without buffering by said intermediate transceiver.

77. (cancelled)

78. (original) The method of claim 76, wherein the distance between each transceiver is that distance which will produce equal to or less than about 90% signal attenuation.

79. (original) The method of claim 76, wherein the distance between each transceiver is that distance which will produce equal to or less than about 80% signal attenuation.

80. (original) The method of claim 76, wherein the distance between each transceiver is that distance which will produce equal to or less than about 70% signal attenuation.

81. (original) The method of claim 76, wherein the distance between each transceiver is that distance which will produce equal to or less than about 60% signal attenuation.

82. (original) The method of claim 76, wherein the lossy environment is penetrated by at least one borehole.

83. (original) The method of claim 76, wherein the lossy environment is penetrated by at least one mineshaft.

84. (original) The method of claim 76, wherein the lossy environment surrounds a cave.

85. (original) The method of claim 76, wherein the transmission frequency is between about 15 Hz and 5 kHz.

86. (original) The method of claim 76, wherein the transmission frequency automatically changes in response to a change in the attenuation factor.

87. (original) The method of claim 76, wherein the transmission frequency automatically changes to a lower frequency in response to a change in the attenuation factor.

88. (original) The method of claim 76, wherein the transmission frequency automatically changes when a transceiver does not receive a transmission within a predetermined period of time.

89. (original) The method of claim 76, wherein the transmission frequency automatically changes to a lower frequency when a transceiver does not receive a transmission within a predetermined period of time.

90. (original) The method of claim 76, wherein the transceivers are positioned in a manner to produce substantially the same signal attenuation from one transceiver to another transceiver.

91. (original) The method of claim 76, wherein a transceiver receiving a signal retransmits the signal on a different frequency from the received signal.

92. (currently amended) A method for transmitting data through a subterranean formation using electromagnetic signals comprising the steps of:

forming at least one passageway through at least part of a subterranean formation;

determining the resistivity of the subterranean formation along the passageway;

selecting at least one frequency for transmitting data;

using said resistivity to determine ~~determining~~ the attenuation profile of the subterranean formation for the frequencies to be used in the subterranean formation;

using the determined attenuation profile to position[[~~ing~~]] transceivers in the passageway such that the amplitude of an electromagnetic signal transmitted between any two transceivers is sufficient to ensure signal reception wherein the transceivers are positioned in the passageway at locations selected to produce equal to or less than about 98% signal attenuation from one transceiver to the next transceiver; [[~~and,~~]]

wherein there are at least two transceivers used in said passageway; and,

transmitting data through the borehole using electromagnetic signals wherein the electromagnetic signal is transmitted in real time without buffering.

93. (original) The method of claim 92, wherein the electromagnetic signals are transmitted at frequencies ranging from about 15 Hz to about 5 kHz.

94. (original) The method of claim 92, wherein the passageway is a borehole penetrating the subterranean formation.

95. (original) The method of claim 92, wherein the passageway is a mineshaft penetrating the subterranean formation.

96. (cancelled)

97. (original) The method of claim 92, the transceivers are positioned in the passageway at locations selected to produce equal to or less than about 90% signal attenuation from one transceiver to the next transceiver.

98. (original) The method of claim 92, the transceivers are positioned in the passageway at locations selected to produce equal to or less than about 80% signal attenuation from one transceiver to the next transceiver.

99. (original) The method of claim 92, the transceivers are positioned in the passageway at locations selected to produce equal to or less than about 70% signal attenuation from one transceiver to the next transceiver.

100. (original) The method of claim 92, the transceivers are positioned in the passageway at locations selected to produce equal to or less than about 60% signal attenuation from one transceiver to the next transceiver.

101. (original) The method of claim 92, wherein the step of transmitting data utilizes an electromagnetic frequency between about 15 Hz and 5 kHz.

102. (original) The method of claim 92, wherein the transmission frequency automatically changes in response to a change in the attenuation factor.

103. (original) The method of claim 92, wherein the transmission frequency automatically changes to a lower frequency in response to a change in the attenuation factor.

104. (original) The method of claim 92, wherein the transmission frequency automatically changes when a transceiver does not receive a transmission within a predetermined period of time.

105. (original) The method of claim 92, wherein the transmission frequency automatically changes to a lower frequency when a transceiver does not receive a transmission within a predetermined period of time.

106. (original) The method of claim 92, wherein the transceivers are positioned in a manner to produce substantially the same signal attenuation from one transceiver to another transceiver.

107. (original) The method of claim 92, wherein a transceiver receiving a signal retransmits the signal on a different frequency from the received signal.

108. (currently amended) A method for simultaneously transmitting data upwards and downwards through a borehole using electromagnetic signals comprising the steps of:

drilling a borehole through at least part of a subterranean formation;

determining the resistivity of the subterranean formation along the path of the borehole;

selecting at least one frequency for transmitting data;

using the determined resistivity to determine ~~determining~~ the attenuation profile of the subterranean formation along the path of the borehole for the frequencies to be used in the downhole environment;

using the determined attenuation profile to position[[~~ing~~]] at least two pairs of transceivers in the borehole such that signal attenuation between transceivers is substantially identical throughout the borehole wherein the transceivers are positioned in the borehole at locations selected to produce equal to or less than about 98% signal attenuation from one transceiver to the next transceiver; and,

transmitting data upwards and downwards through the borehole using electromagnetic signals wherein the electromagnetic signals are transmitted in real time without buffering.

109. (original) The method of claim 108, wherein the electromagnetic frequencies range from about 15 Hz to about 5 kHz.

110. (cancelled)

111. (original) The method of claim 108, the transceivers are positioned in the borehole at locations selected to equal to or produce less than about 90% signal attenuation from one transceiver to the next transceiver.

112. (original) The method of claim 108, the transceivers are positioned in the borehole at locations selected to produce equal to or less than about 80% signal attenuation from one transceiver to the next transceiver.

113. (original) The method of claim 108, the transceivers are positioned in the borehole at locations selected to produce equal to or less than about 70% signal attenuation from one transceiver to the next transceiver.

114. (original) The method of claim 108, the transceivers are positioned in the borehole at locations selected to produce equal to or less than about 60% signal attenuation from one transceiver to the next transceiver.

115. (original) The method of claim 108, wherein the step of transmitting data utilizes an electromagnetic frequency between about 15 Hz and 5 kHz.

116. (original) The method of claim 108, wherein the transmission frequency automatically changes in response to a change in the attenuation factor.

117. (original) The method of claim 108, wherein the transmission frequency automatically changes to a lower frequency in response to a change in the attenuation factor.

118. (original) The method of claim 108, wherein the transmission frequency automatically changes when a transceiver does not receive a transmission within a predetermined period of time.

119. (original) The method of claim 108, wherein the transmission frequency automatically changes to a lower frequency when a transceiver does not receive a transmission within a predetermined period of time.

120. (original) The method of claim 108, wherein the transceivers are positioned in a manner to produce substantially the same signal attenuation from one transceiver to another transceiver.

121. (original) The method of claim 108, wherein a transceiver receiving a signal retransmits the signal on a different frequency from the received signal.

122. (currently amended) A wireless telemetry system comprising:

at least two transceivers capable of sending and receiving electromagnetic signals positioned within a lossy environment;

a distance between the transceivers such that the amplitude of an electromagnetic signal transmitted from one transceiver to another is sufficient to ensure reception wherein the distance between transceivers produces equal to or less than 98% attenuation of an electromagnetic signal transmitted from one transceiver to another transceiver; and

wherein the transceivers are capable of receiving and demodulating a signal and subsequently modulating a new signal using the demodulated signal in real time without buffering.

123. (cancelled)

124. (original) The wireless telemetry system of claim 122, wherein the lossy environment is a subterranean formation penetrated by a borehole and the transceivers are positioned within the borehole.

125. (original) The wireless telemetry system of claim 122, wherein the lossy environment is a mineshaft and the transceivers are positioned within the mineshaft.

126. (original) The wireless telemetry system of claim 122, wherein the lossy environment is a natural opening in the earth and the transceivers are positioned within the opening.

127. (original) The wireless telemetry system of claim 122, wherein the transceivers are capable of sending and receiving electromagnetic signals at frequencies between about 15 Hz and about 5 kHz.

128. (original) The wireless telemetry system of claim 122, wherein the distance between transceivers produces equal to or less than 90% attenuation of the electromagnetic signal transmitted from one transceiver to another transceiver.

129. (original) The wireless telemetry system of claim 122, wherein the distance between transceivers produces equal to or less than 80% attenuation of the electromagnetic signal transmitted from one transceiver to another transceiver.

130. (original) The wireless telemetry system of claim 122, wherein the distance between transceivers produces equal to or less than 70% attenuation of the electromagnetic signal transmitted from one transceiver to another transceiver.

131. (original) The wireless telemetry system of claim 122, wherein the distance between transceivers produces equal to or less than 60% attenuation of the electromagnetic signal transmitted from one transceiver to another transceiver.

132. (original) The wireless telemetry system of claim 122, wherein the distance between transceivers is identical.

133. (original) The wireless telemetry system of claim 122, wherein the distance between transceivers is selected to provide substantially identical signal attenuation in an electromagnetic signal transmitted from one transceiver to another.

134. (Cancelled)

135. (Cancelled)